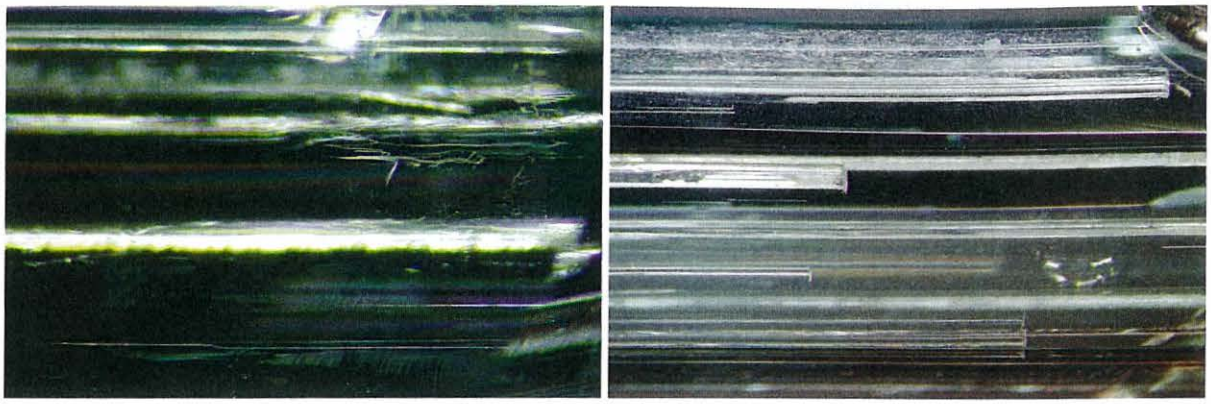

Figure 5: Growth tubes form conspicuous inclusions in the Pakistan beryls. Some of them show a feathery appearance (left, magnified 20×), and the tubes commonly terminate at colourless mineral inclusions (right, magnified 35×). Photomicrographs by C. Williams.

then polished before the analysis. Overall, it contained 0.3–0.6 wt.% FeO, 0.22–0.31 wt.% MgO and 0.14–0.20 wt.% Na_2O. In addition, contents of V_2O_5 ranged from below the detection limit up to 0.02 wt.%, with no relation to colour, whereas Cr_2O_3 was undetectable in the near-colourless areas and up to 0.05 wt.% in the darker green zones.

Blauwet has occasionally encountered limited quantities of this beryl in Pakistan since approximately mid-2011, and it was commonly offered to him as 'emerald'. Its colour banding and growth tubes are similar to those shown by colour-zoned beryl from Torrington and Emmaville in eastern Australia (e.g. Brown, 1998). However, the Australian beryls contained less Fe, and more Cr and V, than the Pakistan stones documented here.

Cara Williams FGA and Bear Williams FGA
(info@stonegrouplabs.com)
Stone Group Laboratories
Jefferson City, Missouri, USA

Alexander U. Falster and
Dr William B. 'Skip' Simmons
Maine Mineral & Gem Museum
Bethel, Maine, USA

Brendan M. Laurs FGA

Reference

Brown G., 1998. Les gisements d'émeraudes en Australie. In D. Giard, Ed., *L'émeraude—Connaissances Actuelles et Prospectives*. Association Française de Gemmologie, Paris, France, 201–204.

Coloration of Green Dravite from the Commander Mine, Tanzania

A recent Gem Note by Williams et al. (2017) documented green/brown dravite from the Commander mine, Simanjiro District, north-eastern Tanzania. A crystal fragment that was studied for that report was subsequently analysed further by the present author to investigate the nature of its green coloration.

The green portion of the sample was sliced into a piece measuring 3 mm thick that was slightly darker at the rim and lighter in the interior. The dichroic colours of the rim were very light bluish green (E ∥ c) and greenish yellow (E⊥c), while the inner region was pale yellow (E ∥ c) to light yellow (E⊥c).

Visible-near infrared (Vis-NIR) spectroscopy with a silicon-diode array microspectrometer showed absorption bands at ~444 nm (more intense in the E ∥ c direction) and at ~606 nm (more intense in the E⊥c direction; Figure 6). An overtone of the OH bands occurred at 979 nm in the E ∥ c direction. These spectra are very similar to those of the V-Cr tourmalines (olenite, uvite and dravite) reported by Ertl et al. (2008). In addition, there is a close resemblance to the spectrum of green dravite from Tanzania (GRR 1719 with V>Cr) available at http://minerals.gps.caltech.edu/manuscripts/2008/V_Olenite/Index.html. The primary difference is the lack of a spin-forbidden

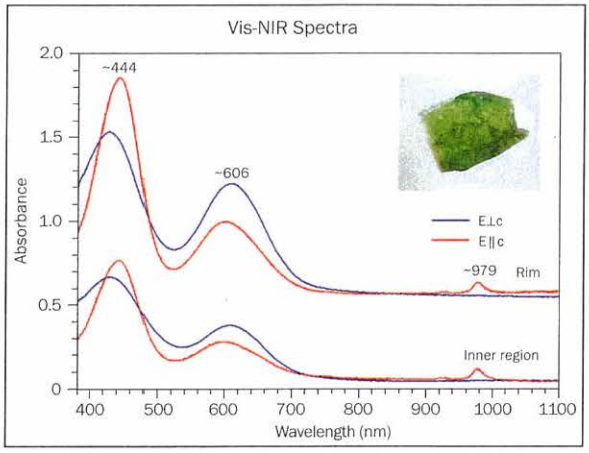

Figure 6: Polarized Vis-NIR spectra of the green dravite recorded absorption bands at ~444 and ~606 nm that are related to vanadium. In addition, an overtone of the OH bands occurred at 979 nm in the E∥c direction. The spectra for the rim are offset vertically for clarity. Inset photo by G. R. Rossman.

chromium band near 700 nm in the Commander mine sample, suggesting a lower Cr content.

This was corroborated by EDXRF chemical analysis using an INAM Expert 3 instrument, which indicated that vanadium is the primary chromophore. The outer darker green rim contained 0.25 wt.% V, 0.044 wt.% Cr and 190 ppm Fe, while the inner, more yellow region had 0.17 wt.% V, 0.036 wt.% Cr and 122 ppm Fe. In addition, both zones contained ~0.40 wt.% Ti.

From Figure 4 in Ertl et al. (2008), the position of the lowest-energy electronic absorption band at 606 nm corresponds to a ratio of V/(V+Cr) of approximately 82% for the darker green rim. This provides good agreement with the EDXRF analyses, which gave V/(V+Cr) ratios of 86% for the rim and 83% for the inner region of the sample. These results clearly indicate that this sample is coloured primarily by vanadium, as is typically the case for 'Cr-tourmaline' from East Africa (Schmetzer and Bank, 1979).

Dr George R. Rossman (grr@gps.caltech.edu)
California Institute of Technology
Pasadena, California, USA

References

Ertl A., Rossman G.R., Hughes J.M., Ma C., Brandstätter F., 2008. V^{3+}-bearing, Mg-rich strongly disordered olenite from a graphite deposit near Amstall, Lower Austria: A structural, chemical and spectroscopic investigation. *Neues Jarhbuch für Mineralogie*, **184**(3), 243–253, http://dx.doi.org/10.1127/0077-7757/2008/0100.

Schmetzer K. and Bank H., 1979. East African tourmalines and their nomenclature. *Journal of Gemmology*, **16**(5), 310–311, http://dx.doi.org/10.15506/jog.1979.16.5.310.

Williams C., Williams B., Laurs B.M., Falster A.U. and Simmons W.B., 2017. Gem Notes: Tourmaline (dravite) from Simanjiro District, Tanzania. *Journal of Gemmology*, **35**(6), 481-482.

Enstatite from Emali, Kenya

In September 2014, gem dealer Dudley Blauwet obtained a parcel of rough yellowish green enstatite from an East African supplier. The material reportedly came from the Emali area, located ~160 km northwest of the Taita Hills in southern Kenya. The parcel contained 65 pieces weighing a total of 45.7 g, and some of the stones had a black 'skin' on their surface, which the cutters were instructed to remove before faceting. Due to this, and the irregular shape of the rough, the cutting yield was relatively low: 82 faceted stones weighing a total of 29.4 carats were returned from Blauwet's cutting factory in April 2015. Blauwet loaned the author four faceted samples of this enstatite (Figure 7) for examination.

The stones consisted of one cushion and three oval cuts that weighed 1.18–1.49 ct. The cushion and one of the oval cuts (left two stones in Figure 7) showed saturated colours: respectively a dark strong green and a medium dark, moderately strong, slightly yellowish green. The other two stones were a very dark, slightly greyish, slightly yellowish green; abundant inclusions reduced their transparency.

Figure 7: These enstatites from Emali, Kenya (1.18–1.49 ct), range from a well-saturated green to a dark 'olive' green. Photo by J. C. Zwaan.